WHAT IS CLAIMED IS:

1. A method of controlling path length in a quantum cryptographic key distribution (QKD) system, comprising:

receiving training symbols transmitted from a QKD transmitter over a QKD path; and

controlling a length of the QKD path based on the received training symbols.

2. The method of claim 1, further comprising:

estimating a phase error associated with transmission of the training symbols over the QKD path.

3. The method of claim 2, wherein estimating the phase error comprises:

determining probabilities of detection events associated with the received training symbols.

4. The method of claim 3, wherein estimating the phase error comprises:

estimating the phase error based on the determined probabilities.

5. The method of claim 2, further comprising:

controlling the length of the QKD path based on the estimated phase error.

6. The method of claim 4, further comprising:

controlling the length of the QKD path based on the estimated phase error.

7. The method of claim 4, wherein estimating the phase error comprises:

performing a least squares estimation of the phase error using the determined probabilities.

8. The method of claim 2, wherein estimating the phase error comprises:

employing at least one Kalman filter to estimate the phase error.

9. The method of claim 4, wherein estimating the phase error comprises:

performing a robust least squares estimation of the phase error using the determined probabilities.

10. The method of claim 9, wherein the robust least squares estimation comprises at least one of least absolute residuals and Bisquare weights.

11. A system for automatically initializing a length of a quantum cryptographic key distribution (QKD) path in a QKD system, comprising:

a QKD receiver configured to receive training symbols from a QKD transmitter over the QKD path;

a phase shifting element disposed on the QKD path; and

processing logic configured to automatically initialize the length of the QKD path, using the phase shifting element, based on the received training symbols.

12. A computer-readable medium containing instructions for controlling at least one processor to perform a method of controlling path length in a quantum cryptographic key distribution (QKD) system, the method comprising:

receiving symbols transmitted from a QKD transmitter over a QKD path; and

controlling a length of the QKD path based on the received symbols.

13. A method of automatically controlling a path length in a quantum cryptographic key distribution system, the path comprising a first interferometer and a second interferometer, the method comprising:

employing a phase shifting element in the second interferometer; and

automatically adjusting the phase shifting element to control the path length based on symbols transmitted over the path.

14. The method of claim 13, wherein the phase shifting element comprises a fiber stretcher.

15. The method of claim 14, wherein automatically adjusting the phase shifting element comprises:

adjusting a voltage applied to the fiber stretcher based on the symbols transmitted over the path.

16. The method of claim 13, wherein the phase shifting element comprises a phase modulator.

17. The method of claim 16, wherein automatically adjusting the phase shifting element comprises:

adjusting a voltage applied to the phase modulator based on the symbols transmitted over the path.

18. The method of claim 13, further comprising:

estimating a phase error associated with symbols transmitted over the path.

19. The method of claim 18, wherein estimating the phase error comprises:

determining probabilities of detection events associated with the symbols transmitted over the path.

20. The method of claim 19, wherein estimating the phase error comprises:

estimating the phase error based on the determined probabilities.

21. The method of claim 18, wherein the phase shifting element is automatically adjusted to control the path length further based on the estimated phase error.

22. The method of claim 20, wherein estimating the phase error comprises:

performing a least squares estimation of the phase error using the determined probabilities.

23. The method of claim 18, wherein estimating the phase error comprises:

employing at least one Kalman filter to estimate the phase error.

24. The method of claim 20, wherein estimating the phase error comprises:

performing a robust least squares estimation of the phase error using the determined probabilities.

25. The method of claim 24, wherein the robust least squares estimation comprises at least one of least absolute residuals and Bisquare weights.

26. A system for automatically controlling a path length in a quantum cryptographic key distribution (QKD) system, comprising:

a QKD path including a first interferometer and a second interferometer;

a phase shifting element disposed in at least one of the first and second interferometers; and

processing logic configured to automatically adjust the phase shifting element to control a length of the path.

27. A method of automatically controlling a path length in a quantum cryptographic key distribution (QKD) system, comprising:

employing a feedback system in the QKD system; and

automatically controlling the path length, using the feedback system, based on symbols transmitted over the path.

28. The method of claim 27, wherein the feedback system comprises a phase shifting element.

29. The method of claim 28, wherein the phase shifting element comprises a fiber stretcher.

30. The method of claim 29, wherein automatically controlling the path length comprises:

adjusting a voltage applied to the fiber stretcher based on the symbols transmitted over the path.

31. The method of claim 28, wherein the phase shifting element comprises a phase modulator.

32. The method of claim 31, wherein automatically controlling the path length comprises:

adjusting a voltage applied to the phase modulator based on the symbols transmitted over the path.

33. The method of claim 27, further comprising:

estimating a phase error associated with symbols transmitted over the path.

34. The method of claim 33, wherein estimating the phase error comprises:

determining probabilities of detection events associated with the symbols transmitted over the path.

35. The method of claim 34, wherein estimating the phase error comprises:

estimating the phase error based on the determined probabilities.

36. The method of claim 33, wherein the path length is automatically controlled further based on the estimated phase error.

37. The method of claim 35, wherein estimating the phase error comprises:

performing a least squares estimation of the phase error using the determined probabilities.

38. The method of claim 33, wherein estimating the phase error comprises:

employing at least one Kalman filter to estimate the phase error.

39. The method of claim 35, wherein estimating the phase error comprises:

performing a robust least squares estimation of the phase error using the determined probabilities.

40. The method of claim 39, wherein the robust least squares estimation comprises at least one of least absolute residuals and Bisquare weights.

41. A quantum cryptographic key distribution (QKD) endpoint, comprising:

a QKD receiver configured to receive symbols transmitted over a QKD path; and

a feedback system configured to control a length of the QKD path based on the received symbols.

42. The QKD endpoint of claim 41, wherein the feedback system comprises a phase shifting element.

43. The QKD endpoint of claim 42, wherein the phase shifting element comprises a fiber stretcher.

44. The QKD endpoint of claim 42, wherein the phase shifting element comprises a phase modulator.

45. The QKD endpoint of claim 41, wherein the feedback system further comprises an estimation system, wherein the estimation system is configured to:

estimate a phase error associated with the symbols transmitted over the QKD path based on the received symbols.

46. The QKD endpoint of claim 45, wherein the feedback system further comprises a training frame system, wherein the training frame system is configured to:

determine probabilities of detection events associated with the symbols transmitted over the QKD path.

47. The QKD endpoint of claim 46, wherein the estimation system is further configured to:

estimate the phase error based on the determined probabilities.

48. The QKD endpoint of claim 45, wherein the estimation system comprises a least squares estimator.

49. The QKD endpoint of claim 45, wherein the estimation system comprises at least one Kalman filter.

50. The QKD endpoint of claim 45, wherein estimation system comprises a robust least squares estimator.

51. QKD endpoint of claim 50, wherein the robust least squares estimator employs at least one of least absolute residuals and Bisquare weights.

52. A method of controlling a length of a path in a quantum cryptographic key distribution (QKD) system, comprising:

determining probabilities associated with a plurality of detection events, the plurality of detection events being associated with a sequence of symbols received over the path in the QKD system; and

controlling the length of the path based on the determined probabilities.

53. The method of claim 52, wherein the probabilities comprise conditional probabilities.

54. The method of claim 52, wherein controlling the length of the path comprises:

estimating a phase error based on the determined probabilities.

55. The method of claim 54, wherein controlling the length of the path further comprises:

controlling the path length of the QKD path further based on the estimated phase error.

56. The method of claim 54, wherein estimating the phase error comprises:

performing a least squares estimation of the phase error using the determined probabilities.

57. The method of claim 54, wherein estimating the phase error comprises:

employing at least one Kalman filter to estimate the phase error.

58. The method of claim 54, wherein estimating the phase error comprises:

performing a robust least squares estimation of the phase error using the determined probabilities.

59. The method of claim 58, wherein the robust least squares estimation comprises at least one of least absolute residuals and Bisquare weights.

60. A quantum cryptographic key distribution (QKD) endpoint, comprising:

a QKD receiver configured to receive a sequence of symbols transmitted over a QKD path;

a phase shifting element disposed on the QKD path; and

processing logic configured to:

determine conditional probabilities associated with a plurality of detection events, the plurality of detection events being associated with the sequence of symbols, and

adjust the phase shifting element to control a length of the QKD path based on the determined conditional probabilities.

61. A computer-readable medium containing instructions for controlling at least one processor to perform a method of controlling a length of a path in a quantum cryptographic key distribution (QKD) system, the method comprising:

determining probabilities associated with a plurality of detection events, the plurality of detection events being associated with a sequence of symbols received over the path in the QKD system; and

controlling the length of the path based on the determined probabilities.

62. A system for controlling a length of a path in a quantum cryptographic key distribution (QKD) system, comprising:

means for determining probabilities associated with a plurality of detection events, the plurality of detection events being associated with a sequence of symbols received over the path in the QKD system; and

means for controlling the length of the path based on the determined probabilities.